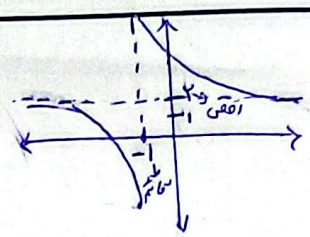


$y - 1 = (x - 1)^3 \Rightarrow \sqrt[3]{y - 1} = x - 1 \Rightarrow x = \sqrt[3]{y - 1} + 1 \Rightarrow R = \mathbb{R}$	(الف)	۱
$yx^2 - 12xy - 1 = 0 \rightarrow \Delta = 144y^2 + 4y \Rightarrow x = \frac{12y \pm \sqrt{144y^2 + 4y}}{2y} \rightarrow \Delta \geq 0 \rightarrow 144y^2 + 4y \geq 0$ $\rightarrow \left[\frac{-1}{144} \mid 0 \right] \rightarrow (-\infty, -1] \cup (0, +\infty) = R$	(ب)	
$y = x^2 - 4x + 1 \rightarrow x_{min} = -\frac{b}{2a} = 2 \rightarrow y_{min} = -3 \rightarrow R = [-3, +\infty)$	(الف)	
$x_{max} = -\frac{b}{2a} = 3 \rightarrow y_{max} = 12 \rightarrow R = (-\infty, 12]$	(ب)	۲
$x_{min} = -\frac{b}{2a} = 2 \rightarrow y_{min} = -7 \rightarrow R = \sqrt{[-7, +\infty)} = [0, +\infty)$	(ج)	
$x_{max} = -\frac{b}{2a} = 3 \rightarrow y_{max} = 9 \rightarrow R = \sqrt{(-\infty, 9]} = [0, 3]$	(د)	
$R = \mathbb{R}$	(الف)	۳
$R = \mathbb{R}$	(ب)	
$R = \sqrt{R} = [0, +\infty)$	(ج)	
$R = [0, +\infty)$	(د)	
$R = \mathbb{R} - \left\{ \frac{a}{c} \right\} = \mathbb{R} - \{3\}$	(الف)	۴
$R = \mathbb{R} - \left\{ \frac{a}{c} \right\} = \mathbb{R} - \{1\}$	(ب)	
$R = \sqrt{\mathbb{R} - \left\{ \frac{a}{c} \right\}} = \sqrt{\mathbb{R} - \{1\}} = [0, +\infty) - \{\sqrt{1}\}$	(الف)	۵
$R = \sqrt{\mathbb{R} - \left\{ \frac{a}{c} \right\}} = \sqrt{\mathbb{R} - \{-1\}} = [0, +\infty)$	(ب)	

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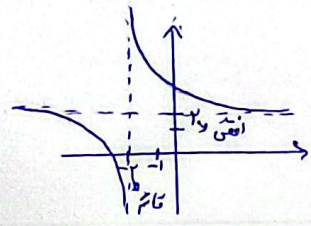
(الف)

$$\begin{cases} \text{عبارت افقی} (\frac{a}{c}) = 2 \\ \text{ریشه مربع} (\text{عبارت قائم}) = -1 \end{cases}$$



(ب)

$$\begin{cases} \text{عبارت افقی} (\frac{a}{c}) = 2 \\ \text{ریشه مربع} (\text{عبارت قائم}) = -2 \end{cases}$$



(الف)

چون نمی‌دانیم $\sin x$ مثبت است یا منفی $\Rightarrow R = (-\infty, -2] \cup [2, +\infty)$

(ب)

$$\frac{x^4}{x^3} + \frac{1}{x^2} \Rightarrow x + \frac{1}{x^2} \Rightarrow R = (-\infty, -2] \cup [2, +\infty)$$

(ج)

$$\sqrt[3]{x^3+1} = \frac{\sqrt[3]{x^3}}{\sqrt[3]{1}} + \frac{1}{\sqrt[3]{1}} \Rightarrow \sqrt[3]{x} + \frac{1}{\sqrt[3]{x}} \Rightarrow R = (-\infty, -2] \cup [2, +\infty)$$

(د)

چون عبارت نامنفی می‌شود پس: $R = [2, +\infty)$

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(الف)

$$x^2 + y(x^2 + y) = x^2(x^2 + y) + 1 \Rightarrow x^4 + x^2(y + 1) - y = 0 \Rightarrow x^4 + b^2 + b(\frac{c-y}{b}) + \frac{1-cy}{c} = 0$$

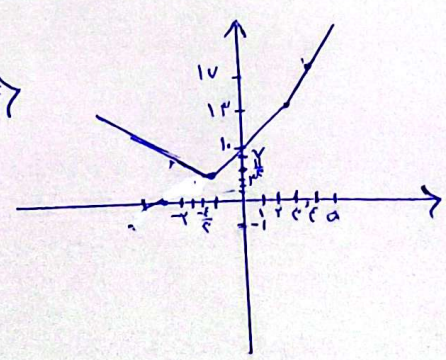
$$\rightarrow \Delta \geq 0 \rightarrow 9 + y^2 - 4y + 12y - 4^2 \geq 0 \rightarrow (y+1)(y+5) \geq 0 \rightarrow \frac{-5-1}{+1-1} R = (-\infty, -5] \cup [-1, +\infty)$$

(ب)

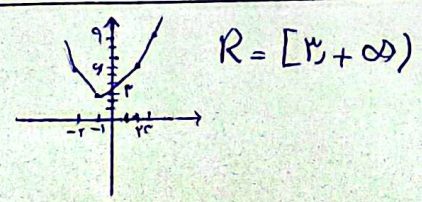
$$\frac{x^2 + t + 1}{\sqrt{x^2 + t}} \rightarrow \sqrt{x^2 + t} + \frac{1}{\sqrt{x^2 + t}} \xrightarrow{\text{مشتق برابر ۰}} \frac{2x}{2\sqrt{x^2 + t}} = x = 0 \rightarrow 1 + \frac{1}{1} = \frac{2}{1} \rightarrow R = [\frac{2}{1}, +\infty)$$

٩

$$\begin{cases} x > 3 & x > 3 \\ 2x + 7 & -\frac{5}{2} < x \leq 3 \\ -\frac{1}{2}(x-1) & x < -\frac{5}{2} \end{cases} \Rightarrow$$

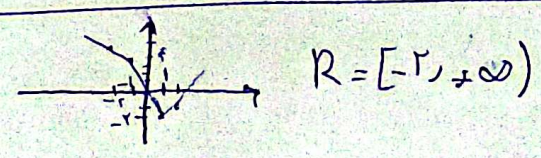


(الف)



$$R = [3, +\infty)$$

(ب)



$$R = [-2, +\infty)$$